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Signed Stephen Hordley

Dated 14 April 2004

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Patents Form 1/77

Patents Act 1977
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31 MAR 2003

The Patent Office

1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

THE PATENT OFFICE
J
31 MAR 2003
LONDON

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

P17500GB-LH/mf

2. Patent application number
(The Patent Office will fill in this part)

01APR03 E796631 5 000389
P01/7700 0.00-0307425.9

0307425.9

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Minebea Co. Ltd.,
4106-73 Oaza Miyota,
Miyota-machi, Kitasaku-gun,
Nagano 389-0293,
Japan.

Patents ADP number *(if you know it)*

4246831006.

If the applicant is a corporate body, give the country/state of its incorporation

Japan

4. Title of the invention

A Spherical Bearing Arrangement

5. Name of your agent *(if you have one)*

Forrester Ketley & Co.

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Forrester House
52 Bounds Green Road
London
N11 2EY

Patents ADP number *(if you know it)*

133001 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

NO YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	-
Description	4
Claim *(s)*	2
Abstract	1
Drawing *(s)*	2 x 2

10. If you are also filing any of the following, state how many against each item.

Priority documents	NONE
Translations of priority documents	-
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	-
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	1
Any other documents *(please specify)*	-

11. I/We request the grant of a patent on the basis of this application.

Forrester Ketley & Co. | Signature: Forrester Ketley & Co. | Date: 31 March 2003

12. Name and daytime telephone number of person to contact in the United Kingdom: (020) 8889 6622 HOARTON, Lloyd

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Notes

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PATENTS ACT 1977

Agent's Ref: P17500GB-LH/mf

A SPHERICAL BEARING ARRANGEMENT

This invention relates to a spherical bearing arrangement and more particularly to a spherical bearing incorporating an elastomeric portion.

GB-A-2 263 948 discloses a so-called hybrid bearing 100 comprising an outer and middle race 101,102 between which is sandwiched an annular rubber layer 103. The inner surface 104 of the middle race 102 is formed with steps 105 to receive a multi-part inner race 106 which is constructed within the middle race 102. In the particular example shown in Figure 1 of the accompanying drawings of a hybrid bearing, the multi-part inner race 106 is assembled and pushed into the middle race 102 which has the rubber layer 103 bonded to its outer surface. The outer race 101 is then swaged and bonded onto the rubber layer 103.

This construction is disadvantageous because it adds approximately 15% in diameter to a comparable non-hybrid bearing because of the additional parts necessary to contain the elastomeric part of the hybrid bearing. It is an object of the present invention to reduce the size of hybrid bearings and also to provide a method of manufacture which is simpler than conventional methods such as that disclosed in GB 2 263 948.

Accordingly, one aspect of the present invention provides a spherical bearing arrangement having a bearing housing and a ball located therein, the

bearing housing having an outer race, an inner race and an annular elastomeric portion sandwiched between the races.

Another aspect of the present invention provides a method of manufacturing a spherical bearing comprising the steps of: swaging an inner race onto a ball; providing an annular elastomeric portion around an outer surface of the inner race; and swaging an outer race onto the elastomeric portion.

In order that the present invention may be more readily understood, embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic cross-section of a spherical bearing arrangement not in accordance with the present invention; and

Figure 2 is a spherical bearing arrangement embodying the present invention.

Referring now to Figure 2 of the drawings, a bearing arrangement 1 embodying the present invention is shown and comprises a spherical bearing 2 having a bearing housing 3 and a ball 4 located therein, the bearing housing 3 having a rigid steel outer race 5 and a rigid steel inner race 6 between which is sandwiched an annular elastomeric portion 7, in this example, a rubber sleeve bonded to both races 5,6. The outer race 5 of the bearing housing may be securely held in an interference fit hole (being an interference fit hole because the internal diameter of the hole is less than the outer diameter of the outer race 5).

Preferably, a self-lubricating liner 8 is provided on the inner surface of the inner race 6 in contact with the ball 4. Alternatively, the inner race 6 and ball 4 may be in direct contact with one another.

The bearing is manufactured as follows. Firstly, the inner race 6 is swaged onto the ball 4. The elastomeric portion 7, the rubber layer, is then bonded to the inner race, preferably by an injection process. 4. Finally, the outer race 5 is swaged onto the inner race 6, sandwiching the rubber layer 7 between the races 5,6. Preferably, in addition to being swaged onto the rubber layer 7 around the inner race 6, a layer of adhesive is applied between the outer race 5 and rubber layer 7 by which the rubber layer 7 is bonded to the outer race 5.

The liner 8 is not essential - the inner race 6 and the ball 4 are both happily manufactured from a metal or metal alloy with the inner race in direct contact with the ball.

The resultant hybrid bearing housing 3 has three main components, none of which need be multi-part components and, because of the small number of components, there is a significant space saving because the size of the outer diameter of the housing has been reduced. Comparing the example of the invention shown in Figure 2 with the conventional hybrid bearing shown in Figure 1, it will be appreciated that the invention allows the entire middle race 102 shown in Figure 1 to be dispensed with by adopting a simpler manufacturing process which leads to a reduction in the diameter of the bearing housing.

In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. A spherical bearing arrangement having a bearing housing and a ball located therein, the bearing housing having an outer race, an inner race and an annular elastomeric portion sandwiched between the races.

2. A bearing arrangement according to Claim 1, wherein the elastomeric portion is bonded to the inner race.

3. A bearing arrangement according to Claim 2, wherein the elastomeric portion is bonded to the inner race by an injection process.

4. A bearing arrangement according to any preceding claim, wherein the elastomeric portion is bonded to the outer race.

5. A bearing arrangement according to any preceding claim, wherein a liner is provided on the inner race in contact with the ball.

6. A bearing arrangement according to Claim 5, wherein the liner is a self-lubricating liner.

7. A bearing arrangement according to any one of Claims 1 to 4, wherein the inner race and ball are both manufactured from metal and the inner race is in direct contact with the ball.

8. A bearing arrangement according to any preceding claim, wherein the elastomeric portion is rubber.

9. A method of manufacturing a spherical bearing comprising the steps of:
swaging an inner race onto a ball;
providing an annular elastomeric portion around an outer surface of the inner race; and
swaging an outer race onto the elastomeric portion.

10. A method according to Claim 9, wherein the step of providing the annular elastomeric portion around the outer surface of the inner race comprises bonding an elastomeric portion to the outer surface of the inner race.

11. A method according to Claim 10, wherein the elastomeric portion is applied by an injection process.

12. A method according to any one of Claims 9 to 11, wherein the outer race is swaged onto the elastomeric portion.

13. A spherical bearing arrangement substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

14. A method of manufacturing a spherical bearing substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

15. Any novel feature or combination of features disclosed herein.

ABSTRACT

"A Spherical Bearing Arrangement"

A spherical bearing arrangement having a bearing housing and a ball located therein, the bearing housing having an outer race, an inner race and an annular elastomeric portion sandwiched between the races and a method of making the same comprising the steps of: swaging an inner race onto a ball; providing an annular elastomeric portion around an outer surface of the inner race; and swaging an outer race onto the elastomeric portion.

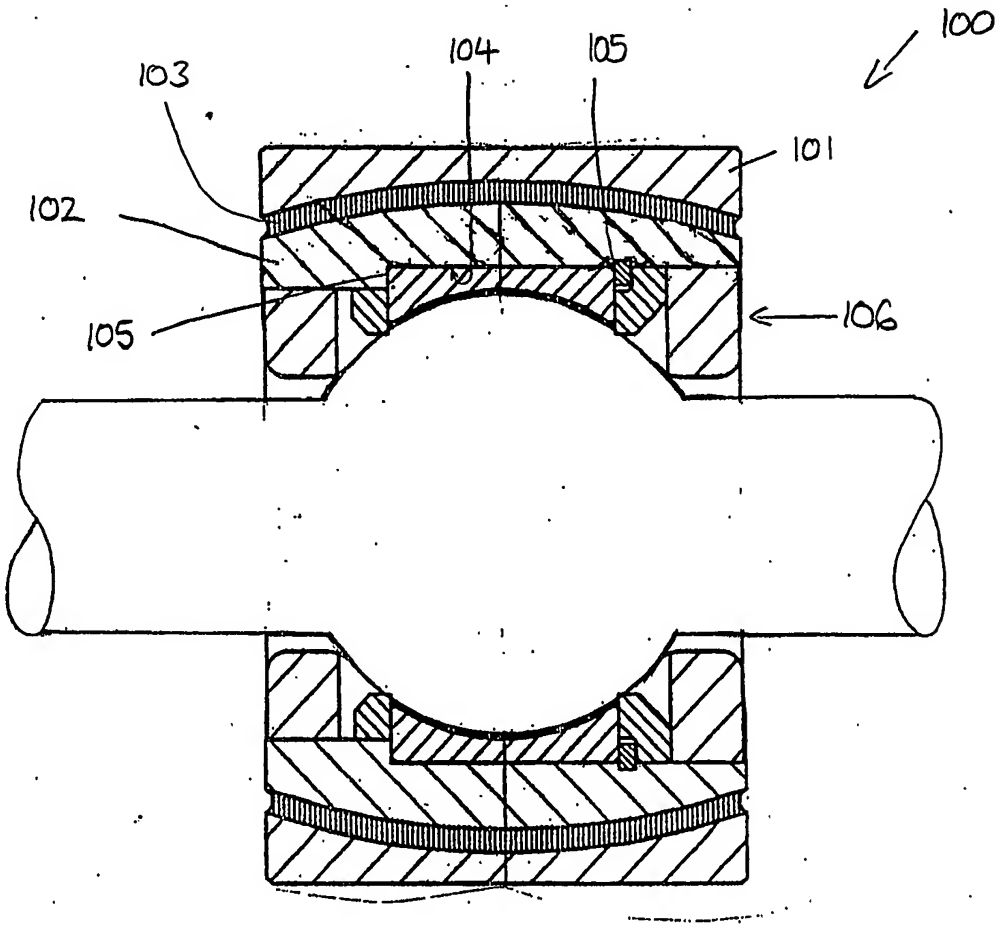

Figure 1

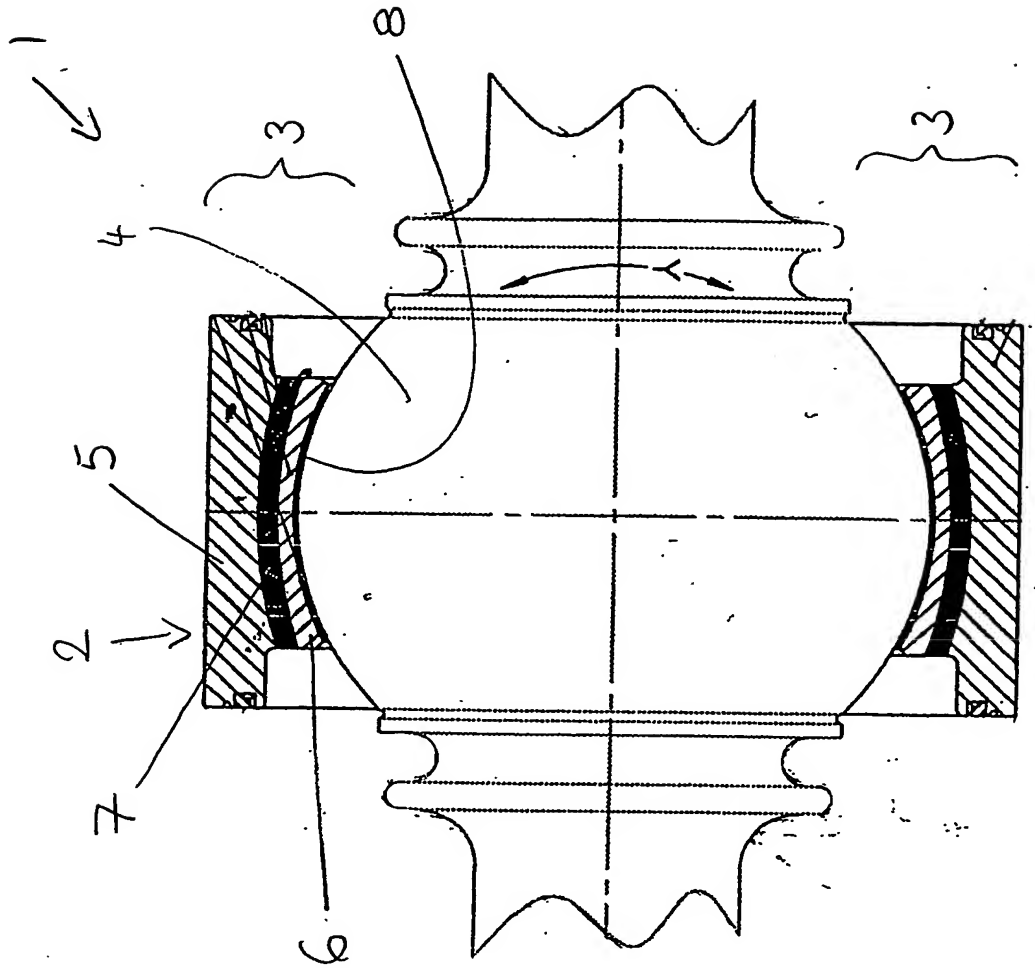

Figure 2